

DEVICE AND METHOD TO ADJUST DISPLAY BRIGHTNESS

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This application claims the benefit under 35 USC §119(a) of Korean Patent Application No. 10-2015-0143875, filed on Oct. 15, 2015, at the Korean Intellectual Property Office, the entire disclosure of which is incorporated herein by reference for all purposes.

BACKGROUND

[0002] 1. Field

[0003] The following description relates to a device and method to adjust display brightness.

[0004] 2. Description of Related Art

[0005] In general, a display device may be used for displaying an image on a television (TV), a notebook, a desktop computer, and the like. Since a display device may have limits as to number of lights that may be generated or used to display an image, the display device may display an image presenting a portion having a relatively high brightness or a portion having a relatively low brightness by adjusting a brightness of the image to compensate for such limits.

SUMMARY

[0006] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[0007] In one general aspect, a method of adjusting a brightness of a display includes, determining current viewpoint brightness information of a current viewpoint region on the display corresponding to a user current viewed point or area of the display, determining previous brightness information of a previous viewpoint region of the display corresponding to a previously viewed point or area of the display, and controlling a displaying of a current image, including the current viewpoint region, with an adjusted brightness for a partial region of the display based on a comparison of the current viewpoint brightness information and the previous brightness information.

[0008] The method may further include adjusting the brightness for the partial region, including temporarily increasing the brightness of the partial region of the display in response to a difference between the current viewpoint brightness information and the previous brightness information meeting a light reaction threshold. The temporary increasing of the brightness of the partial region may include increasing the brightness of the partial region to a first amount beginning in a first light reaction interval, and gradually adjusting the brightness of the partial region to a default brightness during a second light reaction interval, after the first light reaction interval, longer than the first light reaction interval. The default brightness may be a normalized brightness level applied for different viewed points or areas of the display independent of location or time, representing a normalized physiological acclimation to different

input light intensities. The first light reaction interval may be less than one second. The second light reaction interval may be less than ten seconds.

[0009] The temporary decreasing of the brightness of the partial region may include decreasing the brightness of the partial region to a first amount beginning in a first dark reaction interval, and gradually adjusting the brightness of the partial region to a default brightness during a second dark reaction interval, after the first dark reaction interval, longer than the first dark reaction interval. The default brightness may be a normalized brightness level applied for different viewed points or areas of the display independent of location or time, representing a normalized physiological acclimation to different input light intensities.

[0010] The method may further include adjusting the brightness for the partial region, including adjusting a brightness of a target region that includes the viewpoint region.

[0011] The method may further include determining the user current viewed point or area of the display by tracking a head and/or a gaze of the user, and determining the current viewpoint region based on the determined user current viewed point or area.

[0012] The method may further include adjusting the brightness for the partial region, including temporarily decreasing the brightness of the partial region of the display in response to a difference between the current viewpoint brightness information and the previous brightness information not meeting a dark reaction threshold.

[0013] The method may further include determining peripheral brightness information of a peripheral region, as the partial region, that is peripheral of the viewpoint region, wherein the controlling of the displaying of the current image with the adjusted brightness comprises adjusting a brightness of the peripheral region based on a comparison of the viewpoint brightness information and the peripheral brightness information. A radius of an outer radial edge of the peripheral region may be twice a radius of an outer radial edge of the viewpoint region. The adjusting of the brightness of the peripheral region may include decreasing the brightness of the peripheral region in response to a difference between the current viewpoint brightness information and the peripheral brightness information meeting a first emphasis threshold. The controlling of the displaying of the current image may further include controlling a displaying of a sequence of frames while maintaining a result of the decreasing of the brightness of the peripheral region until the peripheral region is no longer displayed or a viewpoint of the viewer changes.

[0014] The adjusting of the brightness of the peripheral region may include increasing the brightness of the peripheral region in response to a difference between the current viewpoint brightness information and the peripheral brightness information failing to meet a second emphasis threshold. The controlling of the displaying of the current image may further include controlling a displaying of a sequence of frames while maintaining a result of the increasing of the brightness of the peripheral region until the peripheral region is no longer displayed or a viewpoint of the viewer changes.

[0015] In another general aspect, a non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the one or more processors to perform a method of displaying a brightness of